

Overall Study Purpose: The purpose of the present study is to investigate the effects of inquiry-based learning in an upper-level mathematics course on students' learning and attitudes. Specifically, we hope to gather survey data on confidence in personal mathematical abilities, anxieties surrounding learning and doing mathematics, and attitudes towards an inquiry-based learning instruction style. Given the growing demand for a workforce skilled in mathematics and problem solving, developing teaching pedagogies that decrease mathematical anxiety and encourage pursuit of the subject is essential. Past research suggests that use of active and inquiry-based learning techniques in mathematics courses often results in a positive effect on both student learning and student attitudes. The present study will help to provide us with information we need to better understand whether or not inquiry-based course work can actually change beliefs. This has the potential to change the approach professors take when teaching mathematics courses on college campuses.

Investigators: Dr. Jessica Williams will be the principle investigator for the present study. She will be in charge of data collection as part of her fall course.

Participants: For this project, we will be recruiting participants from one undergraduate mathematics course. Participants will be drawn from Dr. Williams's upper-level mathematics course (MTH 400.01: Real Analysis, Fall 2016). Students in Dr. Williams' course will be asked to complete questionnaires as part of the course requirements, but can opt out of including their questionnaires in the research study. They will also be asked for their permission for anonymous reporting of written journal responses completed throughout the semester.

Methods: Participants will be asked to complete a questionnaire after each midterm exam and again at the end of the semester. Prior to completing the questionnaires, students will be given information about any potential negative consequences (in this case mild discomfort from disclosure of anxieties) of their participation as well as potential benefits associated with participating. They will also be given the option of opting out of including their results in the research study. The questionnaire packets will take approximately 15 minutes to complete and will include questionnaires assessing beliefs about mathematical abilities, anxieties about learning and doing mathematics, and attitudes towards the inquiry-based structure of the course. Students in this class will be asked to write short journal entries in class portfolios that also address these beliefs, anxieties, and attitudes, and participants in the study will be asked for these responses to be anonymously disclosed. Once data has been collected it will be stored in a secure location (Kuhn Hall 221).

Risks: Completing questionnaires about beliefs and anxieties surrounding mathematics capabilities may be uncomfortable for some participants as it will require them to think seriously about their own fears and insecurities. No significant risks are anticipated from participating in this study.

Benefits: The students will be given access to their results at the conclusion of the semester so they can learn whether or not their beliefs changed as they worked through the course in an inquiry-based format. Additionally, the data and written responses the students provide will allow us to better understand the potential of courses to inspire changes in beliefs and anxieties in students. This information will enable us to devise potential interventions to serve the needs of the Converse

community as well as to inspire other undergraduate programs across the country to adopt similar curriculum.